Chronological summary of flooding events and responses at the Rocky Flats Site, Colorado September 8–24, 2013

Extremely high rainfall and severe flooding occurred across the Front Range of Colorado during the week starting September 8, 2013. Current estimates are that up to 15 inches of rain fell in this area of Colorado during the week, causing significant flooding events that impacted surveillance and maintenance activities at the Rocky Flats Site. The following is a chronological summary of the flooding events and responses taken by the Rocky Flats staff.

Between Sunday, September 8, and Friday, September 13 at approximately 12:50 p.m. (when the gauge stopped working), the rain gauge at the National Renewable Energy Laboratory Wind Farm adjacent to the northwest corner of the Rocky Flats National Wildlife Refuge recorded approximately 13.25 inches of rain. The heaviest rain (approximately 10.50 inches) occurred from Wednesday night to Thursday night. Site rain gauges showed 5.50 to 8.50 inches of rain from September 9 through September 16. Field observations indicated that significant runoff from areas west of the Site contributed to the high stream flows. Evaluation of the data is ongoing.

Wednesday, September 11:

- All automated sampling stations were operating and ready. The site received significant rain starting in the afternoon.

- Wednesday night the area received several inches of rain while parts of nearby counties received much more.

Thursday September 12:

- **Thursday early a.m.:**

    - Site staff were called to determine who could get to work (most employees were delayed due to local flooding). Telemetry checks showed that most automated sampler carboy bottles were full or would be full soon. Surface water sampling equipment at all locations was operating as expected. Most flumes were topped at some point during the previous six hours.

- **Thursday mid-morning:**

  The status of various items was as follows, according to telemetry:

    - The rainfall was heavy at that time.

    - The Walnut Creek Point of Compliance (WALPOC) flume had not been topped yet; the sample bottle was full.

    - The Woman Creek Point of Compliance (WOMPOC) sampler appeared to be malfunctioning due to damage to the flow measurement equipment, but it was still collecting some samples. It appeared that Woman Creek had flowed over the bypass structure into Pond C-2. Pond C-2 water levels had risen about 7 feet in less than two hours.

    - The flume at monitoring location GS03 was topped.

    - GS05 and GS13 were topped. Nearly all other locations would be topped in the next hour.

- At GS01, the flowmeter was working, but sampling had stopped, suggesting the sampling equipment might have been damaged.

- The A-4 and B-5 dams had 1–3 feet of water above their fully open outlet valves.

- **Thursday afternoon:**

  - At about noon, the Pond C-2 water level had fallen to about 2 feet above the outlet, the Pond B-5 water level had fallen to about 1 foot above the outlet, and the Pond A-4 water level had fallen to about 3 feet above the outlet. Wright Water Engineering concurred that there was no concern with dam safety at this point since the valves were open and the water levels were very low compared to maximum capacity.

  - The staff prepared to travel to the site for sampling and inspections once conditions became safe and the rain intensity decreased enough to permit work. The surface water (SW) lead and sampling staff discussed plans, needs, and priorities.

  - A safety check of the site was completed. Roads to the site were open.

  - Operations staff checked the Original Landfill (OLF) and no issues were noted. The Present Landfill (PLF) could not be accessed due to high water in North Walnut Creek flowing over the PLF access road.

  - The sampling team reached GS03, where they retrieved the full sample carboy and reset the sampling station.

  - The U.S. Department of Energy site manager tried to access the site from the east side but rainfall was very heavy and flowing water from the South Woman Creek drainage prevented access. Approximately 2 inches of water was sheet flowing across the prairie. The GS01 "shed" was observed to be partially under water. The site manager advised the sample team they would not be able to access GS01. Woman Creek at Indiana St. rose very quickly, carrying much debris and reaching about 2.5 feet below the road at 2:30 p.m. The center cell of the Standley Lake Protection Project (SLPP) was filling very quickly.

  - The sampling team went into the Central Operable Unit to service other SW stations. A very heavy rainfall started, so the staff returned to the office for safety reasons. Several more inches of rain fell at the site over the rest of the day.

Friday, September 13:

- **Early morning:**

  - The rain had stopped but stream flows remained exceptionally high. The staff had planned to meet at 8:30 a.m. to start sampling, but a Colorado Department of Transportation (CDOT) report stated that Highway 93 was closed at Highway 128. A staff member from Boulder drove to Highway 93 and discussed with CDOT the need to access the site, confirmed that site staff would be allowed through as far as the Rocky Flats west gate, and confirmed that the west gate was accessible and that the access road appeared safe for travel. Another staff member checked Indiana Street from the north side and discovered the street was closed with no access permitted. Another staff member checked Indiana Street from the south side and discovered that no access was permitted. The street closure and high Woman Creek flows meant that GS01 and GS03 could not be accessed.

- **Mid-morning:**

    - The sampling team assembled and spent the day collecting sample carboys and repairing monitoring stations. They were not able to visit all locations.

    - A high water level was observed at Pond A-4. The water level was decreasing, but it had previously risen to nearly the spillway. Although the spillway did not flow, inflow rates in excess of the maximum possible outflow rate caused an increase in retained volume.

Saturday, September 14:

- The sampling team spent the day at the site collecting carboys and assessing and repairing damage to monitoring stations.

- The water level at the A-4 dam was down significantly. Staff called Wright Water Engineers to discuss the path forward. Wright Water Engineers said the staff should leave all valves open to continue to release water quickly.

Sunday, September 15:

- The sampling team left the site at 11:30 a.m. because of heavy rain and safety concerns. At that time, all Points of Compliance (POCs) and Points of Evaluation (POEs) were operating and set at a collection pace predicted to allow sample collection through at least the next 24 hours, based on the weather forecast.

Monday, September 16:

- The sampling team continued to visit automated surface water sampling stations, collecting carboys and replacing them with empty carboys where appropriate.

- Wright Water Engineers inspected the A-4, B-5, and C-2 dams and no issues were noted. The water level in all dams had returned to near or below the outlet level. There was some flow from the A-4, B-5, and C-2 dams.

- Site and landfill inspections were conducted in accordance with Rocky Flats Legacy Management Agreement requirements:

    - The OLF exhibited cracking and subsidence near Berms 4, 5, and 6. Some minor cracking in other areas (e.g., Berm 1) was also observed.

    - The PLF was inspected and no issues were noted.

Thursday, September 19:

- In accordance with the Monitoring and Maintenance Plan, cracks in the OLF cover that could increase water infiltration were filled. Additional repairs are planned after an evaluation by engineering personnel.

- Erosion control inspections were ongoing and determined that most erosion controls were in acceptable condition.

Tuesday, September 24:

- An engineering inspection of the OLF was conducted. The inspecting engineers included a geotechnical engineer.

The following is additional operational information about sampling stations:

- No locations appear to have suffered severe structural damage. Local erosion was also minimal and will not affect the performance of any of the flumes.

- There was varying damage to monitoring equipment at locations WOMPOC, GS01, GS05, GS59, and SW093 caused by the floodwaters and debris. Damage was generally limited to sampling and flow measurement instruments being stripped from the flumes. Repairs were made in the first few days after floodwaters subsided.

- Locations WALPOC, GS03, GS10, GS13, GS51, and SW027 all performed as expected and were essentially undamaged.